INL researchers scaled up hydrogen production this month at the Integrated Laboratory Scale high-temperature electrolysis (HTE) experiment. The project is now making nearly 1,480 gallons of hydrogen per hour.

INL reaches major hydrogen milestone

by Megan Crepeau, *Nuclear Science & Technology Communications*

A team of INL scientists reached a number of milestones recently with the successful production of hydrogen through high-temperature electrolysis (HTE). At 8:45 a.m. on Sept. 5, the Integrated Laboratory Scale experiment started producing hydrogen at a rate of 5.6 cubic meters per hour.

"This is kind of a pivot point," said Carl Stoots, the experiment's principal investigator. "This is by far the biggest achievement we've had."

High-temperature electrolysis is a system of producing hydrogen very efficiently by using technology originally developed for solid oxide fuel cells. HTE is a significant improvement over the more conventional methods to produce hydrogen – using an electric current through water to separate it into hydrogen and oxygen. Combined with a clean power source such as a next-generation nuclear plant, HTE could produce hydrogen at 45 to 55 percent efficiency.

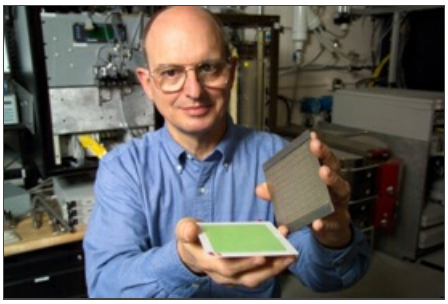
The Integrated Laboratory Scale high-temperature electrolysis setup at INL.

The achievement was recognized at a media event in Idaho Falls on Sept. 18.

September's achievement is a major scale-up from earlier INL experiments on a small scale. INL Laboratory Fellow Steve Herring, who heads the HTE project, said his team wanted it to match the final product closely.

"This test is designed to mimic as much as possible the full-scale plant," he said.

There are several potential applications of hydrogen from high-temperature electrolysis, all of which are closer to being actualized now that HTE has proven itself capable of producing hydrogen at such an advanced level. Hydrogen is commonly used to help produce liquid fuels. Herring said it could also prove helpful in upgrading fuel from the Athabasca Tar Sands in Alberta, Canada, because producing gasoline and diesel fuel from such heavy oil deposits requires extensive amounts of hydrogen and steam.



Steve Herring shows electrolysis components identical to those used in the HTE experiment.

"A lot of the interest in this technology is for unconventional fossil reserves and for synthesis of liquid fuels," Herring said.

With this recent achievement, INL has met Department of Energy milestones at the national and Idaho levels.

"We've achieved all the official goals," Stoots said. "Now we'll let it run."

Herring's team is planning to let the machine run so as to examine the behavior of the fuel cells and determine the reasons for their slow deterioration. Future research will focus on fine-tuning the fuel cells to make them more durable and designing the machine for a larger scale.

With this milestone met, the HTE plant is on its way to opening many doors for innovation in energy production, contributing to the Department of Energy's overarching goal of a "hydrogen economy." Eventually, HTE could provide pure hydrogen for fuel cell-powered cars, Herring said " – but that's a long way off."

Read the project's fact sheet.
Visit the research team's website.

Feature Archive